N 536 - Utilization of Nursing Research in Advanced Practice, Summer 2008

Tzeng, Huey-Ming

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Research Design

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Design Characteristics

- Maximizes control over factors to increase the validity of the findings
- Guides the researcher in planning and implementing a study
Level of Control: Quantitative Research

- Descriptive
- Correlational
- Quasi-experimental
- Experimental

Increased Control with Design
Concepts Relevant to Research Design (1)

**Causality**

- A → B
- Pressure → Ulcer

**Multicausality**

- Years smoking
- High fat diet → Heart disease
- Limited exercise
Concepts Relevant to Research Design (2)

- Probability: Likelihood of an outcome
- Bias: Slanting findings
- Manipulation: Treatment
- Control: All phases of design
Design Validity

- Measure of accuracy of a study

- Examined with critique of the following dimensions:
  - Statistical conclusion validity
  - Internal validity
  - Construct validity
  - External validity
• Controlling the environment of the study setting

• Levels of controlling:
  ○ Natural setting
  ○ Partially controlled setting: e.g., clinics
  ○ Highly controlled setting: e.g., laboratory
Elements of a Strong Research Design (2)

- Controlling the equivalence of subjects and groups
  - Random subject selection
  - Random assignment to groups
Elements of a Strong Research Design (3)

- Controlling the treatment
  - Choose a treatment based on research and practice
  - Develop a protocol for implementation
  - Document the implemented treatment
  - Use a check-list to determine the extent of completeness to which the treatment was implemented
  - Evaluate the treatment during the study
Elements of a Strong Research Design (4)

• Controlling measurement
  ◦ Reliability
  ◦ Validity
  ◦ Number of measurement methods
  ◦ Types of instruments
• Controlling extraneous variables
  o Identify and eliminate extraneous variables via sample criteria, choice of settings, or research design
  o Random sampling
  o Sample: Heterogenous, homogeneous, or matching
  o Statistical control
Problems with Study Designs

- Inappropriate for the study purpose or the research framework
- Poorly developed designs
- The research methods were poorly implemented
- Inadequate treatment, sample, or measurement methods
Selecting a Design

- Is there a treatment?
  - No
  - Yes

  - Is the primary purpose examination of relationships?
    - No
    - Yes

    - Descriptive Design
    - Will the sample be studied as a single group?
      - No
      - Yes

      - Correlational Design

    - Quasi-Experimental Study
      - Will a randomly assigned control group be used?
        - No
        - Yes

        - Is the original sample randomly selected?
          - No
          - Yes

          - Experimental Study
Selecting a Descriptive Design

Examining sequences across time?

- No
  - One Group?
    - No
      - Comparative Descriptive Design
    - Yes
      - Descriptive Design

- Yes
  - Following same subjects across time?
    - No
      - Cross-sectional design
    - Yes
      - 

Studying events partitioned across time?

- No
  - Trend Analysis
- Yes
  - Repeated measures of each subject

Longitudinal study

- Yes
  - Single unit of study

Case Study

Cross-sectional design with treatment partitioning

Longitudinal design with treatment partitioning
A Typical Descriptive Design

Clarity of Interest → Measurement → Description → Interpretation

Variable 1 → Description of Variable 1
Variable 2 → Description of Variable 2
Variable 3 → Description of Variable 3
Variable 4 → Description of Variable 4

Interpretation of Meaning
Development of Hypotheses
A Comparative Descriptive Design

Group I {variables measured}

Describe

Comparison of Groups on Selected Variables

Interpretation of Meaning

Development of Hypotheses

Group II {variables measured}

Describe
Selecting the Type of Correlational Design

- **Describe relationships between/among variables?**
  - Descriptive correlational design

- **Predict relationships between/among variables?**
  - Predictive correlational design

- **Test theoretically proposed Relationships?**
  - Model testing design
A Descriptive Correlational Design

Measurement

Research Variable 1

Description of variable

Examination of Relationship

Interpretation of Meaning

Development of Hypotheses

Research Variable 2

Description of variable
A Predictive Design

Value of Intercept + Value of Independent Variable 1 + Value of Independent Variable 2 = Predicted Value of Dependent Variable
Selecting The Type of Quasi-Experimental Design

- Control Group?
  - No
    - Pretest?
      - No
        - One-group post-test only design
        - Comparison with population values?
          - No
            - Suggest Reevaluating design
          - Yes
            - One group pretest/post-test design
      - Yes
        - Repeated Measures?
          - No
            - Strategy for Comparison
              - No
                - Suggest Reevaluating design
              - Yes
                - Compare treatment & control conditions?
          - Yes
            - Pretest?
Selecting The Type of Experimental Design

- Pretest
  - No: Post-test only control group design
  - Yes: Repeated Measurements?
    - No: Examine effects of confounding variables?
      - No: Multiple sites?
        - No: Pretest/post-test control group design
        - Yes: Randomized clinical trials
          - No: Comparison of multiple levels of treatment
            - No: Examination of complex relationships among variables in relation to treatment
            - Yes: Nested Designs
          - Yes: Randomized Block Design
        - Yes: Blocking?
          - Yes: Randomized Block Design
          - No: Examination of complex relationships among variables in relation to treatment
    - Yes: Repeated measures design
Pretest-Post Test, Control Group Designs

<table>
<thead>
<tr>
<th>Measurement of dependent variables</th>
<th>Manipulation of independent variables</th>
<th>Measurement of dependent variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Randomly selected experimental group</td>
<td>PRETEST</td>
<td>TREATMENT</td>
</tr>
<tr>
<td>Randomly selected control group</td>
<td>PRETEST</td>
<td>POST-TEST</td>
</tr>
</tbody>
</table>

Treatment: Under control of researcher

Findings:
- Comparison of pretest and post-test scores
- Comparison of experimental and control groups
- Comparison of pretest-post-test differences between samples


Uncontrolled threats to validity:
- Testing
- Mortality

Instrumentation:
- Restricted generalizability as control increases
### Post-Test-Only Control Group Design

<table>
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<tbody>
<tr>
<td>Randomly selected experimental group</td>
<td>TREATMENT</td>
</tr>
<tr>
<td>Randomly selected control group</td>
<td></td>
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<th>Treatment:</th>
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<td>Uncontrolled threats to validity:</td>
<td>Instrumentation</td>
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<tr>
<td></td>
<td>Mortality</td>
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<td></td>
<td>Limited generalizability as control increases</td>
</tr>
<tr>
<td>Pain Control Management</td>
<td>Primary Nursing Care</td>
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<td>-------------------------</td>
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<tr>
<td>Traditional care</td>
<td>Unit A</td>
</tr>
<tr>
<td>PRN Medication</td>
<td>Unit B</td>
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<tr>
<td>New approach: “Around the clock” medication</td>
<td>Unit E</td>
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Advantages of Experimental Designs

- More controls in design and conducting a study
- Increased internally validity
  - Decreased threats to design validity
- Fewer rival hypotheses
Advantages of Quasi-Experimental Designs

- More practical
  - Ease of implementation
- More feasible
  - Resources, subjects, time, setting
- More generalizable
  - Comparable to practice
Developing the Design Section of Your Proposal

- Identify the design
  - Name it specifically
- Provide a map of the design
- Discuss your rationale for using this design
- Describe threats to the validity of the chosen design